customer service agents, dispatchers, and receptionists. Operators with a more technical background and an interest in telecommunications may advance into positions installing and repairing equipment. Promotion to supervisory positions is also possible.

Job Outlook

Employment of communications equipment operators is projected to decline through 2008, largely due to new laborsaving communications technologies and consolidations in the telecommunications industry. Virtually all job openings will result from the need to replace communications equipment operators who transfer to other occupations or leave the labor force.

Developments in communications technologies, specifically the ease and accessibility of voice recognition systems, will continue to have a significant impact on the demand for telephone operators. The decline in employment will be sharpest among directory assistance operators; smaller decreases will occur for central office and switchboard operators. Voice recognition technology allows automated phone systems to recognize human speech. Callers speak directly to the system, which interprets the speech and then connects the call. Because voice recognition systems do not require callers to input data on a telephone keypad, they are easier to use than touch tone systems, and are accessible to rotary phone customers. The systems are also increasingly sophisticated in terms of the vocabulary and grammatical structures they can understand. However, many companies will continue to employ operators so those callers having problems can access a "live" employee if desired.

Electronic communications, such as the Internet and e-mail, provide alternatives to telephone communications and require no operators. Internet directory assistance services are expected to reduce the need for directory assistance operators. Local phone companies currently have the most reliable phone directory data; however, Internet services provide information such as addresses and maps, in addition to phone numbers. As telephones and computers converge, the convenience of Internet directory assistance is expected to attract many customers, eliminating the need for telephone operators to provide this service.

Consolidations among telephone companies also will reduce the need for operators. As communications technologies improve and long distance prices fall, telephone companies will consolidate their operator functions. Operators will be employed at fewer locations and will serve larger customer populations.

Earnings

Median hourly earnings of switchboard operators in 1998 were $8.76. The middle 50 percent earned between $7.20 and $10.63. The lowest 10 percent earned less than $6.21 and the highest 10 percent earned more than $12.86. Median hourly earnings in the industries employing the largest numbers of switchboard operators in 1997 are shown below:

Telephone communications	$10.90
Offices and clinics of medical doctors	8.60
Hospitals	8.40
Hotels and motels	8.30
Personnel supply services	8.30
Miscellaneous business services	7.40

Median hourly earnings of central office operators in 1998 were $12.61. The middle 50 percent earned between $8.73 and $15.97. The lowest 10 percent earned less than $7.12 and the highest 10 percent earned more than $18.33.

Median hourly earnings of directory assistance operators in 1998 were $14.68. The middle 50 percent earned between $9.94 and $16.32. The lowest 10 percent earned less than $7.61 and the highest 10 percent earned more than $18.42.

Many central office and directory assistance operators working at telephone companies are members of the Communications Workers of America (CWA), or the International Brotherhood of Electrical

Workers (IBEW). According to the CWA, telephone operators started at an average of $235 a week in 1998, and after 4 years on the job averaged $654 a week. According to the IBEW, hourly wages for most telephone operators ranged from a minimum of about $10.50 to a maximum of about $17.30 in 1999. For these operators, union contracts govern wage rates, wage increases, and the time required to advance from one pay step to the next (it normally takes 4 years to rise from the lowest paying, nonsupervisory operator position to the highest). Contracts also call for extra pay for work beyond the normal 6 1/2 to 7 1/2 hours a day or 5 days a week, for Sunday and holiday work, and for a pay differential for night work and split shifts. Many contracts provide for a 1-week vacation with 6 months of service; 2 weeks for 1 to 6 years; 3 weeks for 7 to 14 years; 4 weeks for 15 to 24 years; and 5 weeks for 25 years and over. Holidays range from 9 to 11 days a year.

Related Occupations

Other workers who provide information to the general public include dispatchers; hotel, motel, and resort desk clerks; information clerks; receptionists; reservation and transportation ticket agents; and travel clerks.

Sources of Additional Information

For more details about employment opportunities, contact your telephone company or write to:

☞ Communications Workers of America, 501 3rd St. NW., Washington, DC 20001. Internet: **http://www.cwa-union.org**

☞ International Brotherhood of Electrical Workers, Telecommunications Department, 1125 15th. St. NW., Room 807, Washington, DC 20005.

For more information on the telephone industry, contact:

☞ United States Telephone Association, 1401 H St. NW., Suite 600, Washington, DC 20005-2164. Internet: **http://www.usta.org**

Computer Operators

(O*NET 56011 and 56014)

Significant Points

- Employment is expected to decline sharply, due to advances in technology.

- Opportunities will be best for operators who are familiar with a variety of operating systems and who keep up to date with the latest technology.

Nature of the Work

Computer operators oversee the operation of computer hardware systems, ensuring that these machines are used as efficiently as possible. They may work with mainframes, minicomputers, or networks of personal computers. Computer operators must anticipate problems and take preventive action, as well as solve problems that occur during operations.

The duties of computer operators vary with the size of the installation, the type of equipment used, and the policies of the employer. Generally, operators control the console of either a mainframe digital computer or a group of minicomputers. Working from operating instructions prepared by programmers, users, or operations managers, computer operators set controls on the computer and on peripheral devices required to run a particular job.

Computer operators load equipment with tapes, disks, and paper, as needed. While the computer is running—which may be 24 hours a day for large computers—computer operators monitor the control console and respond to operating and computer messages. Messages indicate the individual specifications of each job being run. If an error

message occurs, operators must locate and solve the problem or terminate the program. Operators also maintain logbooks or operating records, listing each job that is run and events such as machine malfunctions that occur during their shift. In addition, computer operators may help programmers and systems analysts test and debug new programs. (See the statements on computer programmers and computer systems analysts, engineers, and scientists elsewhere in the *Handbook*.)

As the trend toward networking computers accelerates, a growing number of computer operators are working on personal computers (PCs) and minicomputers. In many offices, factories, and other work settings, PCs and minicomputers are connected in networks, often referred to as local area networks (LANs) or multi-user systems. Whereas users in the area operate some of these computers, many require the services of full-time operators. The tasks performed are very similar to those performed on large computers.

As organizations continue to look for opportunities to increase productivity, automation is expanding into additional areas of computer operations. Sophisticated software coupled with robotics, enable a computer to perform many routine tasks formerly done by computer operators. Scheduling, loading and downloading programs, mounting tapes, rerouting messages, and running periodic reports can be done without the intervention of an operator. Consequently, these improvements will change what computer operators do in the future. As technology advances, the responsibilities of many computer operators are shifting to areas such as network operations, user support, and database maintenance.

Working Conditions

Computer operating personnel generally work in well-lighted, well-ventilated, comfortable rooms. Because many organizations use their computers 24 hours a day, 7 days a week, computer operators may be required to work evening or night shifts and weekends. Shift assignments usually are made based on seniority. However, increasingly automated operations will lessen the need for shift work, because many companies let the computer take over operations during less desirable working hours. In addition, advances in telecommuting technologies— such as faxes, modems, and e-mail—and data center automation, such as automated tape libraries, enable some operators to monitor batch processes, check systems performance, and record problems for the next shift.

Since computer operators generally spend a lot of time in front of a computer monitor, as well as performing repetitive tasks such as loading and unloading printers, they may be susceptible to eyestrain, back discomfort, and hand and wrist problems.

Computer operators load equipment with tapes, disks, and paper as needed.

Employment

In 1998, computer operators held about 251,000 jobs. The majority of jobs for computer operators are found in organizations such as wholesale trade establishments, manufacturing companies, data processing service firms, financial institutions, and government agencies that have data processing needs requiring large computer installations. A large number of computer operators are employed by service firms in the computer and data processing services industry, as more companies contract out the operation of their data processing centers.

Training, Other Qualifications, and Advancement

Workers usually receive on-the-job training in order to become acquainted with their employer's equipment and routines. The length of training varies with the job and the experience of the worker. However, previous work experience is the key to obtaining an operator job in many large establishments. Employers generally look for specific, hands-on experience with the type of equipment and related operating systems they use. Additionally, formal computer-related training, perhaps through a community college or technical school, is recommended. Related training can also be obtained through the Armed Forces and from some computer manufacturers. As computer technology changes and data processing centers become more automated, increasingly more employers will require candidates to have formal training and experience for operator jobs.

Because computer technology changes so rapidly, operators must be adaptable and willing to learn. Analytical and technical expertise are also needed, particularly by operators who work in automated data centers, to deal with the unique or high-level problems a computer is not programmed to handle. Operators must be able to communicate well, to work effectively with programmers or users, as well as with other operators. Additionally, computer operators must be able to work independently, because they may have little or no direct supervision.

A few computer operators may advance to supervisory jobs, although most management positions within data processing or computer operations centers require advanced formal education, such as a bachelor's (or higher) degree. Through on-the-job experience and additional formal education, some computer operators may advance to jobs in areas such as network operations or support. As they gain experience in programming, some operators may advance to jobs as programmers or analysts. A move into these types of jobs is becoming much more difficult, as employers increasingly require candidates for more skilled computer jobs to possess at least a bachelor's degree.

Job Outlook

Employment of computer operators is expected to decline sharply through the year 2008. Experienced operators are expected to compete for the small number of openings that will arise each year to replace workers who transfer to other occupations or leave the labor force. Opportunities will be best for operators who are familiar with a variety of operating systems and who keep up to date with the latest technology.

Advances in technology have reduced both the size and cost of computer equipment, while increasing the capacity for data storage and processing automation. These improvements in technology have fueled an expansion in the use of sophisticated computer hardware and software in practically every industry in such areas as factory and office automation, telecommunications, medicine, education, and administration. The expanding use of software that automates computer operations gives companies the option of making systems user-friendly, greatly reducing the need for operators. These new technologies will require operators to monitor a greater number of operations at the same time and be capable of solving a broader range of problems that may arise. The result is that fewer and fewer operators will be needed to perform more highly skilled work.

Computer operators who are displaced by automation may be reassigned to support staffs that maintain personal computer networks or assist other members of the organization. Operators who keep up with changing technology, by updating their skills and enhancing their training,

should have the best prospects of moving into other areas such as network administration and technical support. Others may be retrained to perform different job duties, such as supervising an operations center, maintaining automation packages, or analyzing computer operations to recommend ways to increase productivity. In the future, operators who wish to work in the computer field will need to know more about programming, automation software, graphics interface, client/server environments, and open systems, in order to take advantage of changing opportunities.

Earnings
Median annual earnings of computer operators, except peripheral equipment operators were $25,030 in 1998. The middle 50 percent earned between about $20,410 and $31,610 a year. The lowest 10 percent earned less than $16,260; the highest 10 percent earned more than $39,130. Median annual earnings in the industries employing the largest numbers of computer operators, except peripheral equipment operators in 1997 are shown below:

Computer and data processing services	$24,300
Hospitals	23,600
Personnel supply services	22,600
Federal government	22,500
Commercial banks	20,200

In the Federal Government, computer operators with a high school diploma started at about $21,600 a year in 1999; those with 1 year of college started at $23,000. Applicants with operations experience started at higher salaries.

Median annual earnings of peripheral equipment operators were $22,860 in 1998. The middle 50 percent earned between $18,240 and $29,370 a year. The lowest 10 percent earned less than $14,870; the highest 10 percent earned more than $37,220.

According to Robert Half International, the average starting salaries for console operators ranged from $26,000 to $35,500 in 1999. Salaries generally are higher in large organizations than in small ones.

Related Occupations
Other occupations involving work with computers include computer scientists, engineers, and systems analysts; computer programmers, and computer service technicians. Other occupations in which workers operate electronic office equipment include data entry keyers, secretaries, typists and word processors, and typesetters and compositors.

Sources of Additional Information
For information about work opportunities in computer operations, contact firms that use computers such as banks, manufacturing and insurance firms, colleges and universities, and data processing service organizations. The local office of the State employment service can supply information about employment and training opportunities.

Court Reporters, Medical Transcriptionists, and Stenographers

(O*NET 55302A and 55302B)

Significant Points
- A high school diploma is sufficient for stenographers; employers prefer medical transcriptionists who have completed a vocational school or community college program; and court reporters usually need a 2- or 4-year postsecondary school degree.
- Overall employment is projected to grow about as fast as the average, as rapid growth among medical transcriptionists is offset by the decline among stenographers.
- Because of their relatively high salaries, keen competition should exist for court reporter positions; certified court reporters and medical transcriptionists should enjoy the best job prospects.

Nature of the Work
Although court reporters, medical transcriptionists, and stenographers all transcribe spoken words, the specific responsibilities of each of these workers differ markedly. Court reporters and stenographers typically take verbatim reports of speeches, conversations, legal proceedings, meetings, and other events when written accounts of spoken words are necessary for correspondence, records, or legal proof. Medical transcriptionists, on the other hand, translate and edit recorded dictation by physicians and other healthcare providers regarding patient assessment and treatment.

Court reporters document all statements made in official proceedings using a stenotype machine, which allows them to press multiple keys at a time to record combinations of letters representing sounds, words, or phrases. These symbols are then recorded on computer disks or CD-ROM, which are then translated and displayed as text in a process called computer-aided transcription. Stenotype machines used for real-time captioning are linked directly to the computer. As the reporter keys in the symbols, they instantly appear as text on the screen. This is used for closed captioning for the hearing-impaired on television, or in courts, classrooms, or meetings. In all of these cases, accuracy is crucial because there is only one person creating an official transcript.

Although many court reporters record official proceedings in the courtroom, the majority of court reporters work outside the courtroom. Freelance reporters, for example, take depositions for attorneys in offices and document proceedings of meetings, conventions, and other private activities. Others capture the proceedings in government agencies of all levels, from the U.S. Congress to State and local governing bodies. Court reporters who specialize in captioning live television programming, commonly known as *stenocaptioners*, work for television networks or cable stations captioning news, emergency broadcasts, sporting events, and other programming.

Medical transcriptionists use headsets and transcribing machines to listen to recordings by physicians and other healthcare professionals. These workers transcribe a variety of medical reports about emergency room visits, diagnostic imaging studies, operations, chart reviews, and final summaries. To understand and accurately transcribe dictated reports into a format that is clear and comprehensible for the reader, the medical transcriptionist must understand the language of medicine, anatomy and physiology, diagnostic procedures, and treatment. They also must be able to translate medical jargon and abbreviations into their expanded forms. After reviewing and editing for grammar and clarity, the medical transcriptionist transcribes the dictated reports and returns them in either printed or electronic form to the dictator for review and signature, or correction. These reports eventually become a part of the patient's permanent file. (Medical secretaries, who are discussed in the *Handbook* statement on secretaries, may also transcribe as part of their jobs.)

Stenographers take dictation and then transcribe their notes on a word processor or onto a computer diskette. They may take dictation using either shorthand or a stenotype machine, which prints shorthand symbols. General stenographers, including most beginners, take routine dictation and perform other office tasks such as typing, filing, answering telephones, and operating office machines. Experienced and highly skilled stenographers often supervise other stenographers, typists, and clerical workers and take more difficult dictation. For example, skilled stenographers may attend staff meetings and provide word-for-word records or summary reports of the proceedings to the participants. Some experienced stenographers take dictation in foreign languages; others work as public stenographers serving traveling business people and others. Technical stenographers must know the medical, legal, engineering, or scientific terminology used in a particular profession.